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**WESTERN BIRDS**

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WESTERN BIRDS

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# ECOLOGY OF NESTING HAWAIIAN COMMON GALLINULES AT HANALEI, HAWAII

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The Hawaiian subspecies of the Common Gallinule (*Gallinula chloropus sandvicensis*) is endangered (U.S. Fish and Wildlife Service 1980). As recently as 1891, Munro (1960) found the species common on all the main Hawaiian Islands with wetlands, but by 1947 its status was precarious (Schwartz and Schwartz 1949). Currently the gallinule remains only on the islands of Oahu and Kauai (Shallenberger 1977). Loss of habitat, predation by introduced mammals and hunting (prior to closures in 1939) are listed as the major causes for the decline (Hawaiian Waterbirds Recovery Team 1977).

Gallinules have been counted along with other waterbirds in semi-annual statewide censuses since 1970 (Hawaii Department of Land and Natural Resources unpubl. data). A detailed summary of the distribution of Hawaiian waterbirds, including gallinules, was provided by Shallenberger (1977). Our study is the first of the nesting ecology of the Common Gallinule in Hawaii, although other subspecies have been studied (e.g., Howard 1940, Fredrickson 1971, Krauth 1972, Relton 1972, Wood 1974, Bell and Cordes 1977, Brackney 1979).

Since 1970 the U.S. Fish and Wildlife Service has acquired five refuges in Hawaii for enhancement of endangered waterbirds. This study was undertaken to provide data for gallinules as an aid in habitat development and management decisions on the new refuges.

## STUDY AREA

The study was conducted at Hanalei National Wildlife Refuge, a 371-ha area located at the lower end of the Hanalei River valley (Figures 1 and 2). The valley has been used for the cultivation of irrigated taro (*Colocasia esculenta*), from which the traditional Hawaiian food "poi" is made, since at least 610 ± 95 A.D. (Schilt 1980). In 1980 approximately 50 ha of the refuge was in taro production. Taro is grown in constantly flowing water which is

approximately 5 to 8 cm deep. Diked paddies ranged from 0.1 to 0.4 ha in area. The agricultural cycle is as follows:

dry fallow — field drained, lasts 1 to 6 mos (occurs every second or third cycle)
wet fallow — field flooded, lasts 1 to 3 mos (occurs after dry fallow and after harvest)
planting — leafless stems planted in wet paddies (accomplished in 1 to 3 wks)
growth — gradual growth of leaves until complete canopy forms (canopy closes at about 4 mos, plants mature at 14 mos)
harvest — entire plants removed (harvest followed by either wet or dry fallow)

Harvesting is accomplished on a sustained-yield basis, so a taro farm always contains paddies in various stages of the agricultural cycle. An interspersion of habitats occurs ranging from open water to dense stands of robust emergents (taro).

The average temperatures at Hanalei vary between 21° and 26°C. Seasonal variations are slight. The annual rainfall at the refuge is approximately 2 m, but 8 km up the valley the annual average is 10 m (U.S. Weather Service records).

## METHODS

The study was initiated by Zeillemaker, the first resident manager of Hanalei National Wildlife Refuge. He made observations of gallinules incidental to other duties from 1975 to early 1977. During mid-to late 1977,

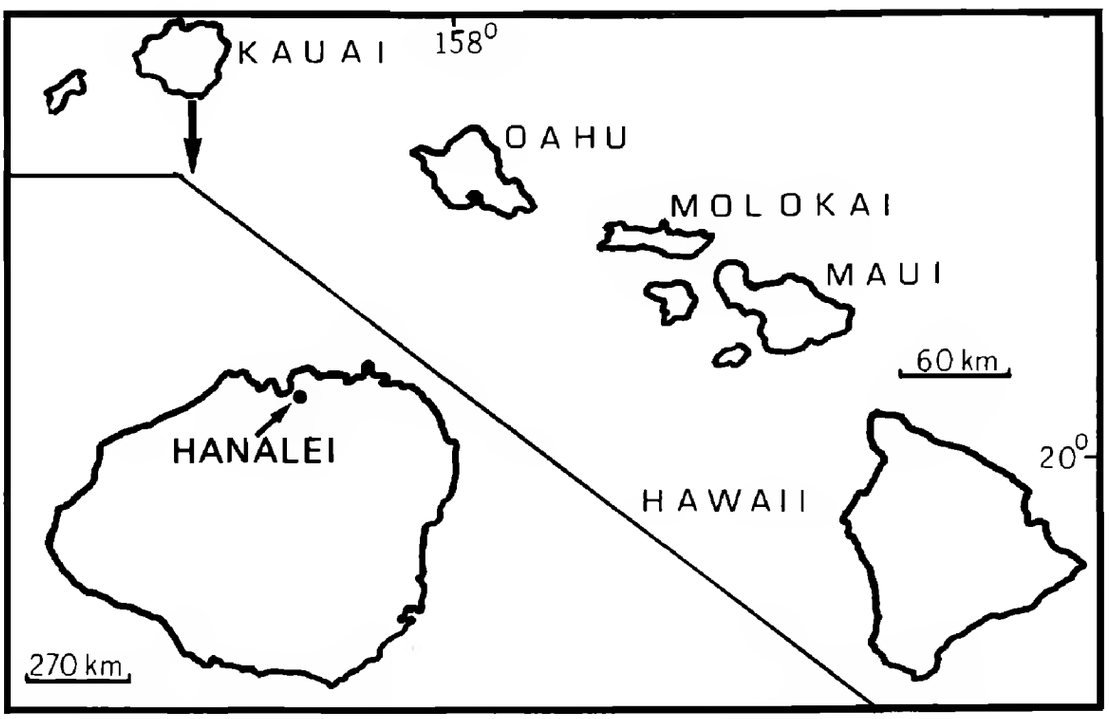


Figure 1. The main Hawaiian Islands with Hanalei NWR identified in the inset.

when Zeillemaker left and Byrd arrived, few observations were recorded, but in 1978 and 1979 more time was devoted to the study than previously. In April 1980, Byrd left, and infrequent observations were continued by D. Moriarty throughout the summer.

Systematic searches of taro paddies for gallinule nests were not possible due to the risk of taro root damage by walking among the plants. Farmers reported nests they discovered while weeding or harvesting. It is not known what percentage of the nests were discovered and reported.

At the first visit to each nest, measurements were made of eggs and nests, the stage of incubation was estimated by floatation (Westerkov 1950), and the clutch size was recorded. The date of clutch initiation was determined by using a laying rate of one egg per day (Relton 1972, Krauth 1972) and backdating. If the eggs were fresh, nests were usually rechecked within 3 days to determine if more eggs were present. At nests where incubation was well underway, checks were made every 5 to 10 days until hatching occurred.

Adult gallinules eat egg shells or carry them away from nests (Fredrickson 1971), therefore little evidence of hatching remained at successful nests. We assumed that an egg hatched if it was present in the nest late in incubation but was not found in or near the nest after hatching. A search for eggs, shell fragments or membranes was always made within a 5-m radius of nests.

Brood counts were recorded only when extended observations indicated a high probability that all chicks were seen. Chicks were assigned to age classes commonly used for waterfowl (Yocum and Harris 1965).

Figure 2. Hanalei NWR, Kauai, Hawaii, photographed from the overlook.
*Photo by C.F. Zeillemaker*

## RESULTS AND DISCUSSION

### *Nest Sites*

At Hanalei all nests were supported by the sturdy stems of dense taro (Figure 3). Only 4 of 80 (5%) nests occurred in taro less than 4 months old, the age at which the canopy started to close. Gallinules have been found nesting in *Scirpus, Typha, Paspalum, Brachiaria* and *Nelumbo* elsewhere in Hawaii (Shallenberger 1977, T. Burr and R. Coleman pers. comm.). Weller and Fredrickson (1973) suggested that species of plants used by gallinules for nesting was unimportant as long as it is a robust emergent. Apparently this statement is widely true (United States — Fredrickson 1971, Krauth 1972, Bell and Cordes 1977, Reagan 1977, Strohmeyer 1977; England — Relton 1972, Wood 1974; Finland — Karhu 1973).

The average water depth at 16 gallinule nests at Hanalei was 6.5 cm (s.d. = 1.2 cm), much shallower than the 30-cm to 2-m depths recorded at nests elsewhere (Fredrickson 1971, Bell and Cordes 1977, Reagan 1977, Brackney 1979). Nest sites with deeper water were not available at Hanalei, but in marshes with variable depths elsewhere, Brackney (1979) found that gallinules chose deeper areas. The birds also preferred deep marshes to shallow marshes. Deep water apparently protects nesting birds from mammalian predators: e.g., six gallinule nests were destroyed by predators within 1 week after a drastic reduction in water levels on Brackney's (1979) study area.

### *Nests*

Nests at Hanalei were oblong with outside dimensions of over 27 cm, and they averaged approximately 5 cm deep (Table 1). The top of the rim of 10 nests averaged 13.7 cm (s.d. = 2.4 cm) above the bottom of the taro field, and 7.2 cm above the water. Wood (1974) found nests of a similar size in England — 20 to 25 cm in diameter, 2 to 5 cm deep.

Taro leaves were available at every nest, but they were used in construction of only 64.6% of the nests, and they comprised only 53.6% of the material used in the nests where they occurred (Table 2). Apparently plants other than taro were favored for nest construction if they were available nearby. Wood (1974) recorded a similar situation in which a pair of gallinules nesting in a clump of reeds brought sedge leaves from 12 m away to build their nest. Elsewhere, gallinules usually construct nests from the same plant that supports the nest (Fredrickson 1971, Reagan 1977).

Table 1. Dimensions (in cm) of Common Gallinule nests at Hanalei National Wildlife Refuge, Kauai, Hawaii.

| | Outside Diameter | Inside Diameter | Depth | Height of Nest Rim Above the Water |
|---|---|---|---|---|
| Average | 27.3 x 25.4 | 16.6 x 15.4 | 5.1 | 6.7 |
| Standard Deviation | 4.0 x 3.1 | 1.8 x 1.6 | 1.4 | 1.2 |
| Sample Size | 27 | 27 | 24 | 10 |

Figure 3. Common Gallinule nest supported by taro.

*Photo by G.V. Byrd*

Table 2. Plants used for nest construction by Common Gallinules at Hanalei National Wildlife Refuge, Kauai, Hawaii.

| | *Percent Occurrence** | *Percent Composition*** | |
|---|---|---|---|
| Species | $\bar{x}$ | $\bar{x}$ | S.D. |
| *Colocasia* | 64.6 | 53.6 | 35.9 |
| *Brachiaria* | 39.6 | 36.4 | 30.3 |
| *Cyperus* | 33.3 | 47.1 | 37.6 |
| *Commalina* | 16.7 | 38.5 | 34.2 |
| *Echinochola* | 14.6 | 27.1 | 24.1 |
| *Azolla* | 14.6 | 13.3 | 14.4 |

* n = 48
** n = 22

*Eggs*

The average size of 114 gallinule eggs measured at Hanalei was 44.1 mm (s.d. = 1.9 mm) × 31.5 mm (s.d. = 1.0 mm). These measurements are almost identical with those made by Witherby et al. (1938-1941) in Great Britain and by Bent (1926) and Simmons (1915) in the United States. Unaccountably, 29 eggs measured in Iowa were shorter (40.4 mm x 31.4 mm; Fredrickson 1971).

*Nesting Chronology*

At Hanalei clutches were completed in all months except December and January (Figure 4), with a peak from April through June. The data for 1978 are the most complete, and while there may have been real annual differences in nesting peaks, they were probably less marked than the small sample sizes suggest. Shallenberger (1977) reported that gallinules nest year-round in Hawaii, and he recognized a peak in activity from March through August.

Two marked pairs of resident Common Gallinules in South Africa (34°S) nested continuously and were repeatedly successful for 48 months, and Siegfried and Frost (1975:102) assumed that the species has the capacity for reproducing "whenever and for as long as conditions are favourable." In more temperate areas gallinules are usually migratory, and eggs are found April to July (Brown 1944, Fredrickson 1971, Karhu 1973, Wood 1974, Reagan 1977, Bell and Cordes 1977, Brackney 1979). The height of nesting cover, which is controlled by temperature and water levels, may determine when nesting occurs (Weller and Spatcher 1965).

*Incubation Period*

The period between laying of the last egg and hatching of the first egg was 22 days in the two nests for which it was known at Hanalei. We could not determine whether gallinules began incubating before the last egg was laid at Hanalei, but slightly asynchronous hatching was noted.

Reports of the timing of initiation of incubation in other areas vary widely: e.g., Krauth (1972) found that incubation began after the fifth egg (of eight or

nine) was laid, but Karhu (1973) concluded that incubation began after the first egg was laid. Wood (1974) clarifies the situation somewhat. He found that in first nests incubation usually did not start until completion of the clutch, but in renests or second nests it began when about half the clutch was laid or earlier. The problem of knowing when incubation starts makes it difficult to interpret reported incubation periods, but most authors report periods of 19 to 22 days (Witherby et al. 1938-1941, Brown 1944, Krauth 1972, Relton 1972, Karhu 1973, Wood 1974).

*Brood Rearing*

Only one gallinule family with known-age chicks was frequently observed at Hanalei. The chicks were fed by the adults at first, but by the age of 21 to 25 days the brood began to spend part of the day feeding independently, yet within 20 m of the adults.

Captive gallinule chicks fed independently at about 21 days old (Karhu 1973), and Howard (1940) saw adults driving away 21-day old chicks. Wood (1974) found that parents occasionally fed chicks until they were 45 days old, but that a reduction in reliance of chicks on parents occurred by the age of 25 days.

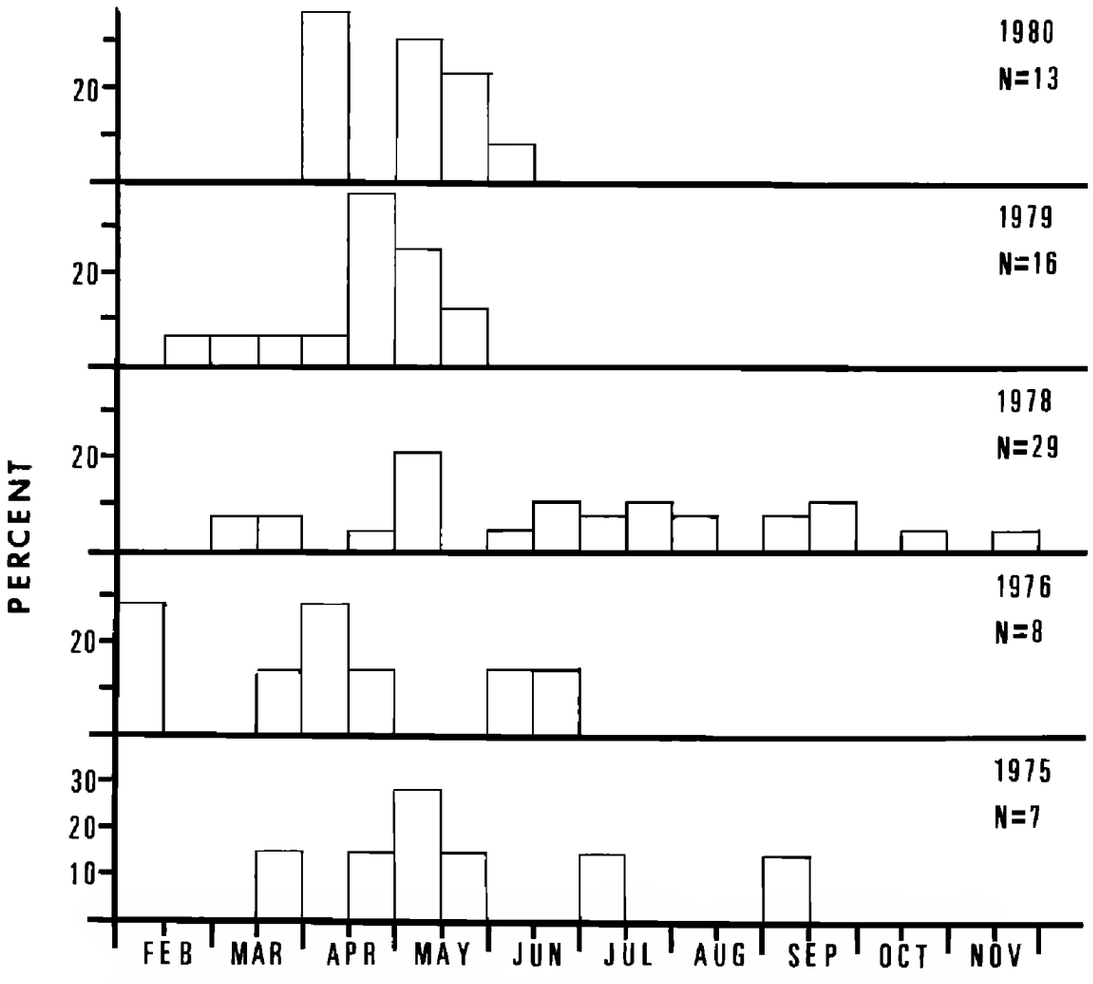


Figure 4. Distribution of clutch completion dates of Common Gallinules at Hanalei NWR, Kauai, Hawaii.

Table 3. Average clutch sizes of Common Gallinules at Hanalei National Wildlife Refuge, Kauai, Hawaii.

| | 1975 | 1976 | 1978 | 1979 | 1980 | 5-year Average |
|---|---|---|---|---|---|---|
| Average | 5.3 | 5.7 | 5.3 | 5.6 | 6.0 | 5.6 |
| Standard Deviation | 0.8 | 1.4 | 1.3 | 1.1 | 1.3 | 1.2 |
| Sample Size | 7 | 7 | 28 | 13 | 9 | 64 |

*Multiple Broods*

There was circumstantial evidence of second broods at Hanalei. Periodically a nest would hatch in a particular taro paddy, and 40 to 60 days later another nest would hatch near or at the same location. Elsewhere two broods are routinely raised, three broods are fairly common (Karhu 1973 summarizes literature), and four broods have been successfully raised in one season (Benthum 1931). In an unusual situation where the food supply may have been supplemented, two pairs of gallinules produced 33 and 32 broods respectively in a 48-month period (Siegfried and Frost 1975).

Groups of gallinules containing two adults and both downy and nearly-fledged chicks were occasionally seen at Hanalei. These "multiple brood family units" (Wood 1974:150) have also been recorded elsewhere. The older chicks feed younger chicks (Brown 1944), collect food for parents which in turn feed younger chicks (Wood 1974), incubate eggs if the pair has not yet hatched the second clutch (Robertson 1964), and brood younger siblings (Bull 1972, Wood 1974).

*Clutch Size*

At Hanalei gallinules laid from 4 to 8 eggs per clutch, and averaged 5.6 eggs (Table 3). The true average could have been slightly higher as eggs could have been lost before nests were found. The average gallinule clutch in the continental United States is larger than at Hanalei, but those in England are a similar size (Table 4). A factor that might account for the high average clutches reported in the continental United States is the occasional clutch with up to 14 or even 17 eggs reported by most authors. These large clutches are probably the result of second females laying in nests with completed clutches (Witherby et al. 1938-1941, Relton 1972, Shallenberger 1977). Relton (1972) suggested this phenomenon was due to the second hen being without her own territory. No large clutches were recorded at Hanalei (Table 3), perhaps indicating there was no shortage of nest territories.

*Nesting, Hatching, and Fledgling Success*

At least one egg hatched in nearly 75% of all nests at Hanalei, and in successful nests 75% of the eggs hatched (Table 5). Although our sample of Class I broods was small, it appears high mortality occurred before chicks attained their first feathers, the stage at which they were considered to be

Class II (Table 6). Since average brood sizes do not include pairs that lost all their chicks (because we could not identify them), the estimate of 2.3 fledglings per pair (54.8% of the eggs hatched) is probably high.

Table 4. Clutch sizes of Common Gallinules at various locations.

| Average Clutch* | Sample Size | Location | Source |
|---|---|---|---|
| 10.0 | 26 | Pennsylvania | Harlow (1918) |
| 9.1 | 142 | Texas | Cottam and Glazener (1959) |
| 8.6 | 35 | Louisiana | Causey et al. (1968) |
| 8.1 | 11 | Louisiana | Bell and Cordes (1977) |
| 8.1 | 18 | Wisconsin | Krauth (1972) |
| 8.0 | 55 | Ohio | Brackney (1979) |
| 7.1 | 13 | Iowa | Fredrickson (1971) |
| 6.6 | 2278 | Great Britain | Huxley and Wood (1976) |
| 6.0 | 39 | England | Relton (1972) |
| 5.4 | 40 | England | Wood (1974) |

* First and subsequent clutches and replacement clutches combined

Table 5. Productivity* of Common Gallinules at Hanalei National Wildlife Refuge, Kauai, Hawaii.

| | 1975 | 1976 | 1978 | 1979 | 1980 | 5-year Average |
|---|---|---|---|---|---|---|
| Nesting Success | 71(7)** | 86(7) | 75(24) | 80(10) | 62(13) | 75(61) |
| Hatching Success | 68(5) | 82(6) | 71(24) | 70(10) | 84(8) | 75(53) |
| Fledging Success*** | 69(6) | 81(22) | 61(21) | 46(6) | | 64(55) |

* Expressed in percentages
** Sample size in parenthesis
*** Percentage of chicks that fledged based on brood counts

Table 6. Brood sizes of Common Gallinules at Hanalei National Wildlife Refuge, Kauai, Hawaii.

| Age Class | 1975 | 1976 | 1978 | 1979 | 4-year Average |
|---|---|---|---|---|---|
| I | | 3.8(5)* | 4.0(4) | 5.0(4) | 4.3(13) |
| II and III | 3.0(19) | 2.8(12) | 3.0(5) | 2.3(4) | 2.8(40) |
| Fledgling | 2.5(6) | 2.4(22) | 2.3(21) | 1.8(6) | 2.3(55) |

* Sample size in parenthesis

Table 7. Nesting, hatching and fledging success* of Common Gallinules at various locations.

| Location | Nesting Success | Hatching Success | Fledging Success | Source |
|---|---|---|---|---|
| Texas | 79 | 60 | | Cottam and Glazener (1959) |
| Louisiana | | 97 | 32 | Bell and Cordes (1977) |
| Louisiana | | 85 | | Causey et al. (1968) |
| Louisiana | | 86 | 71 | Fowler et al. (1971) |
| Wisconsin | 61 | 50 | | Krauth (1972) |
| Ohio | 77 | 83 | 89 | Brackney (1979) |
| England | 66 | 94 | 91 | Relton (1972) |
| England | 21 | 18 | 96 | Wood (1974) |
| Great Britain | 65 | | | Huxley and Wood (1976) |

* Expressed in percentages

In other gallinule studies, nesting success was 60 to 79% in all areas except one, but hatching and fledgling success varied greatly (Table 7).

Flooding was the major cause of nest failure at Hanalei (Table 8), but of the nests where entire clutches were lost, 21% was taken by dogs, cats or human vandals. The cause of egg loss in successful nests was generally not known, but the discovery of pecked egg shells near 10 nests suggests that predation by birds may have been a major contributor. The Common Myna (*Acridotheres tristis*) is a known egg predator in Hawaii (Schwartz and Schwartz 1949, Byrd 1979), and the species is common at Hanalei. Another possible predator found at the refuge is the Black-crowned Night Heron (*Nycticorax nycticorax*). This species is known to be an opportunistic feeder in Hawaii (Shallenberger 1977) and elsewhere (Wolford and Boag 1971). Only four eggs that may have been infertile were discovered at Hanalei.

Others have observed low infertility rates in gallinules (Krauth 1972, Relton 1972, Wood 1974, Brackney 1979). Predation is widely listed as the most important cause of egg and chick loss in gallinules (Miller 1946, Krauth 1972, Relton 1972, Wood 1974, Huxley and Wood 1976, Bell and Cordes 1977, Brackney 1979). Flooding has been reported as a major cause of egg loss in some studies (Wood 1974, Huxley and Wood 1976, Brackney 1979).

Table 8. Causes of Common Gallinule nest failure* at Hanalei National Wildlife Refuge, Kauai, Hawaii.

| | *Percent of total nest failure* | | | | | |
|---|---|---|---|---|---|---|
| Event | 1975 | 1976 | 1978 | 1979 | 1980 | Five-year Average |
| Flooding | 50(1)** | 100(1) | 67(4) | 100(2) | 80(4) | 79(12) |
| Predation | 50(1) | | 33(2) | | 20(1) | 21(4) |

* For nests in which the cause was known
** Sample size in parenthesis

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# RECENT COLONIZATION OF LASSEN PEAK, CALIFORNIA, BY THE GRAY-CROWNED ROSY FINCH

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The Gray-crowned Rosy Finch (*Leucosticte tephrocotis*) occurs throughout the Pacific states of North America in alpine habitat with suitable cliffs. One small "island" of such habitat, Lassen Peak in northeastern California, has never been reported to support the species despite considerable ornithological survey (Grinnell et al. 1930, Johnson 1975 and others). I and others have made a number of observations indicating that the species has recently colonized the Lassen area. This area is of particular interest because volcanism modified the habitat during eruptions between 1914 and 1921, and the area lies between the major ranges of the two well-marked subspecies *L. t. littoralis* and *L. t. dawsoni*. The purposes of this paper are to review previous surveys of the area, to report and discuss recent records, to document breeding status and subspecies identity, and to suggest causes of recent colonization.

## STUDY AREA

Lassen Peak is the southernmost major peak in the Cascade Range, located in Lassen Volcanic National Park, Shasta County, California. The park forms a somewhat isolated area of high elevation habitat. Treeline elevation varies locally within the park. Approximately 31 $km^2$ of treeless terrain exist in the area mainly above 2580 m. Of this only 3.6 $km^2$ rise above 2900 m with 93% of this area on Lassen Peak itself. Precipitation averages 108 cm with 79% falling (mainly as snow) between November and April. Cliffs adjacent to permanent snowfields, similar to those described as preferred by rosy finches (Johnson 1965), are present on Lassen Peak and in a few other nearby locations. The very sparse vegetation in the alpine area consists of prostrate shrubs, forbs, sedges and grasses (Grinnell et al. 1930, Gillett et al. 1961). The peak was volcanically active during 1914 to 1921 when a series of small to moderate eruptions occurred. Impacts of the eruptions on local vegetation are not well documented, but some indirect evidence is available and will be discussed later. The area received intensive vertebrate survey by the Museum of Vertebrate Zoology, University of California, during the 1920s (Grinnell et al. 1930) and has received attention from ornithologists, park naturalists and numerous visitors since.

## METHODS

I searched for rosy finches during 12 visits (36.5 hours total) to Lassen Peak and adjacent alpine areas from June to October in 1979 (4 visits), 1980 (7 visits) and 1981 (1 visit). I received records of sightings from files at the park headquarters and from notebooks used by editors of the Middle Pacific Coast Region of *American Birds*. Most observers were contacted directly to confirm identifications. I analyzed topography and amount of volcanic distur-

bance from photographs taken during the eruptive phase, historical records, USGS topographic maps and my own reconnaissance. Map areas were calculated using dot grids, without attempting to correct for slope.

It is not possible to distinguish the various brown-cheeked rosy finch forms in the field (N.K. Johnson pers. comm.). For convenience, in this paper I have assumed that the brown-cheeked form seen on Lassen Peak is *L. t. dawsoni*, since this is expected from current breeding distributional information (see Results). However, *L. t. tephrocotis* does occur during winter in lowlands 60 km east of Lassen Peak. Thus, it is possible but unlikely that the latter form is that occurring at Lassen Peak.

## RESULTS

### *Evidence for former absence*

Grinnell et al. (1930) conducted the first survey of the Lassen Peak area of sufficient intensity to assure accuracy with respect to presence or absence of rosy finches. They made many trips to the top of the peak and found no evidence of the species. Other records of absence result from less intensive and systematic work. Two visitor-oriented publications contain bird lists which do not include rosy finches (Stebbins and Stebbins 1953, Milne 1966). During 1957, R.E. Johnson (pers. comm.) spent many days on Lassen Peak and adjacent alpine areas and did not find rosy finches. During September 1973, he also spent a day searching the peak and did not find the species (Johnson 1975). (His 1973 visit was brief and late in the season; thus absence is not certain during that year.) Finally, no records of rosy finches appear in park observation files prior to 1966.

### *Records of occurrence*

Table 1 summarizes all known records of Gray-crowned Rosy Finches in Lassen Volcanic National Park. All records come from Lassen Peak itself. Based on written descriptions and discussions with observers, I believe that all except one record are completely reliable. Roy's 1975 record simply states "seen 1 pair on top of peak by visitor"; I have included it for completeness only. Despite the non-systematic nature of such data, some conclusions seem warranted.

From the following details of observations in Table 1, it is apparent that a small breeding population has colonized the peak. I observed two birds that appeared to be defending a cliff in July 1979. Johnson observed a flock containing juveniles in August 1979. In August 1980, Showers and Showers saw adults feeding young. I also observed a juvenile in September 1980. In 1981 I saw a loose flock of 15-25 birds in 3-5 family groups; young in indistinct plumage begged vigorously from adults, although no actual food exchange was seen. The increase in breeding season records since 1975 may indicate that the population was established and breeding in that year. All first observations by different observers were made without knowledge of other records, except those of Laymon and Johnson; they visited the peak after hearing of records made by others. Although activity by birdwatchers has certainly increased during the last decade, it seems likely that this concentration of observations really signifies a recent arrival and continued presence of the species.

Table 1. Recorded observations of Gray-crowned Rosy Finches on Lassen Peak, Shasta, Co., California. See Methods section for comments on identification of *L. t. dawsoni*.

| DATE | SUBSPECIES | DETAILS | OBSERVER |
|---|---|---|---|
| 13 Jul 1966 | — | Sm. flock: ads. and juvs. | S. H. Matteson |
| 17 Jul 1975 | — | 2 indiv. | *fide* J. Roy |
| Summer 1976 | — | 1 indiv. | H. Gray |
| 26 Nov 1976 | *L. t. littoralis* | 2 indiv. | D.A. Gaines |
| 7 Dec 1976 | — | 1 indiv. | S.A. Laymon[1] |
| 5 Jul 1977 | — | 1+ indiv. | H. Gray |
| 4 Jul 1979 | — | 3-5 indiv. | D.A. Airola |
| 14 Aug 1979 | — | 20+ indiv.; juvs. seen | R.E. Johnson |
| 29 Aug 1979 | — | Sm. flock | S.H. Matteson |
| 18 Aug 1980 | *L. t. dawsoni* | 10 indiv. (est.); juvs. fed by ads. | M.A. and D.W. Showers[2] |
| 29 Sep 1980 | 1 *L. t. littoralis* (ad.) and 1 *L. t. dawsoni* (juv.) identified | 4-5 indiv. in 1 flock | D.A. Airola[2] |
| 26 Jul 1981 | 2 *L. t. littoralis* (ads.) and 1 *L. t. dawsoni* (ad.) identified | 15+ indiv. in 3+ family groups in a loose flock. Juvs. begged from ads. | D.A. Airola |

[1]Winter and Erickson 1977
[2]Evens and LeValley 1981

Most intriguing is the 1966 record of adults and juveniles which suggests breeding, followed by an 8-year period during which no sightings are known. Two possible explanations exist: 1) the species colonized successfully in 1966 or earlier and was simply missed during 1967 to 1974; or 2) the species bred in 1966 but was absent in intervening years and did not become established until 1975 or thereabouts. Although the existing evidence does not rule out either possibility, I believe the latter to be more reasonable. The fact that 10 records were made by 8 observers during 5 of 6 years since 1976 suggests that had the birds been present during 1967 to 1974, they would have been recorded.

Interpretation of the status of birds observed in late fall 1976 is inconclusive because 1) *L. t. littoralis* regularly moves south to northeastern California, arriving in early to mid-November (AOU 1957, R.E. Johnson pers. comm.), 2) drought conditions during that year may have altered rosy finch distribution, and 3) the drought also permitted unusual late season access by observers to the peak by automobile.

*Subspecies identity*

Lassen Peak is of particular interest regarding subspecies identity of Gray-crowned Rosy Finches because it is an isolated mountaintop of alpine habitat occurring between the main bodies of the breeding ranges of *L. t. littoralis* and *L. t. dawsoni* (Johnson 1975). *L. t. littoralis* is reported to occur in the Cascades, from Alaska south to Mt. Shasta in California, and in various interior ranges in Oregon (AOU 1957, Johnson 1975). *L. t. dawsoni* is known from the White and Sweetwater mountains and the Sierra Nevada in California and Nevada, although distribution in the northern Sierra consists of disjunct populations on isolated mountaintops (AOU 1957, Johnson 1975). *L. t. dawsoni* is also present on Mt. Shasta, the only locale where hybridization of the two forms has been reported (Miller 1939, Johnson 1975).

All instances in which subspecies were determined on Lassen Peak are presented in Table 1. Showers and Showers made positive identification of *L. t. dawsoni*. Some birds showed the characteristic small gray head patch; others lacked gray altogether, a seasonal characteristic due to wear in *L. t. dawsoni* but not in *L. t. littoralis* (R.E. Johnson pers. comm.). I saw one adult *L. t. littoralis* and a juvenile *L. t. dawsoni* in first prebasic molt (showing the narrow gray head patch), both in the same flock in 1980. This observation extends the breeding season range of *L. t. littoralis* south by about 110 km from Mt. Shasta. In 1981, I identified two adult *L. t. littoralis* and one adult *L. t. dawsoni*, all with young. As noted earlier, no conclusions regarding status can be drawn from Gaines' late fall record of *L. t. littoralis*.

## DISCUSSION

*Reasons for recent colonization*

Explanation of the recent colonization and establishment of the Gray-crowned Rosy Finch on Lassen Peak must consider why the Lassen area was not formerly occupied, and what changes have permitted the species to occur now. Grinnell et al. (1930:96) attributed the species' absence during the 1920s to an insufficient area and poor quality of the alpine habitat. The limited area hypothesis is inadequate in light of the recent records. Johnson (1975) expressed surprise that the species had not been recorded on Lassen. (He was not aware of the 1966 record.) He attributed its absence to the possibility that "too little time has elapsed for reestablishment of the alpine ecosystem since the volcanic eruptions of 1914 through 1921." Because of its dependence on alpine plant seeds and insects for food (Twining 1940, Johnson 1965), the species apparently could not survive on the peak until recently when the alpine vegetation had recovered sufficiently to provide adequate numbers of seed plants and their associated insects.

Evaluation of the extent of destruction of the flora by the Lassen eruptions and its possible subsequent recovery is made difficult by a lack of information. The flora by Gillett et al. (1961) lists species and locales, but provides little information on abundance. Alpine plant cover or abundance has not been systematically surveyed at any time before or after the eruptions. Still, an indication of the impacts of volcanic activity was derived from a variety of

sources. Types of alpine disturbance caused by volcanism on Lassen include 1) lava flow, 2) erosion from lava-melted snow, 3) ash and debris deposition, and 4) physical disturbance by eruption-generated winds. Of these, only 1) and 2) have left easily discernible evidence. I have calculated from early photos (Loomis 1926), USGS topographic maps and personal reconnaissance that a minimum of 43% of the area above 2930 m was heavily impacted by these two sources. Impacts of ash and debris deposition and winds are less evident. Volcanic ash depths of 7.5 to 12.5 cm were reported during the early eruptive period from the immediate vicinity of the craters, whereas depths of only 1.2 cm were found 0.8 km south of the summit (Loomis 1926, Abbey, n.d.). Ejection of larger debris destroyed a lookout station and its rock foundation 0.25 km from the crater and sent many large boulders tumbling down the slope of the peak (Loomis 1926, Abbey n.d.). Winds from the largest eruption, a horizontal blowout on the northeast side of the summit, blew mature timber down in a swath 0.8 km wide and up to 6.4 km away (see photographs in Loomis 1926). These disturbances surely had significant additional impacts on the alpine vegetation.

Most alpine plant destruction was concentrated on the west, north and east faces of the peak. The south face appears to have been considerably less damaged because the prevailing southerly winds reduced ash deposition on the south slope, and a small intervening ridge and a number of large emergent rock masses protected portions of the slope from rolling debris and lava-generated mudflows. In contrast to the timber destruction on the northeast slope, increment corings of White-bark Pines (*Pinus albicaulis*) now growing at 2930 m on the south slope 1.1 km from the summit craters show that the trees survived the volcanic period (unpubl. data). Plants on this slope may have served as a major source from which recolonization of the alpine flora occurred following subsidence of the eruptions.

The results of the preceding analysis are consistent with Johnson's (1975) original hypothesis that volcanic disturbance was responsibile for the absence of rosy finches. Additional botanical investigation is needed to quantify the degree to which vegetation has colonized heavily disturbed areas. Such work would be important in describing the extent of vegetation recovery and the minimum degree to which the alpine community must be developed to support rosy finches.

Although I believe the preceding scenario to be most consistent with the available evidence, it is remotely possible that a small population has occurred continuously or intermittently on Lassen Peak since the eruption and was missed by observers. A small amount of suitable habitat occurs in areas adjacent to Lassen Peak that did not receive significant volcanic disturbance.

*Subspecies considerations*

Except for the neighboring Mt. Shasta, Lassen Peak is the only breeding locality where both *L. t. littoralis* and *L. t. dawsoni* have been reported to occur. More work will be needed to determine if hybridization of the two forms occurs here as it does on Mt. Shasta. The fact that an adult *L. t. littoralis* type was found in the same small (family?) group as a juvenile *L. t. dawsoni* type in September suggests that hybridization may have already

occurred. The results of this natural experiment deserve closer monitoring to determine if 1) hybridization occurs freely between types, 2) proportions of each pure type or contributions by each type to the hybrid form vary over time, and 3) the situation on Lassen differs from that on Mt. Shasta with respect to the amount of hybridization and relative contribution by each form to the population.

## CONCLUSION

A likely scenario explaining changes in rosy finch status on Lassen Peak is as follows. Although no documentation exists, it is likely that a small population of Gray-crowned Rosy Finches existed on Lassen prior to the most recent volcanic activity. The eruptions in 1914 to 1921 destroyed much of the birds' alpine plant food source and the species was not recorded until 1966. Establishment was not successful until approximately 1975, 58 years after the last major eruption in 1917, presumably when the alpine vegetation had recovered sufficiently to support a viable population.

Because of its unique setting as a recently disturbed alpine "island" existing between the ranges of the two well-marked subspecies *L. t. littoralis* and *L. t. dawsoni*, Lassen Peak provides an excellent setting for further studies of possible minimum habitat requirements of the species and of the long-term results of co-occurrence of both subspecies. An especially important need is for collection of a few specimens to absolutely determine the identity of the brown-cheeked rosy finch form on Lassen. The population appears to be sufficiently large to allow a few birds to be judiciously taken for this purpose.

## ACKNOWLEDGMENTS

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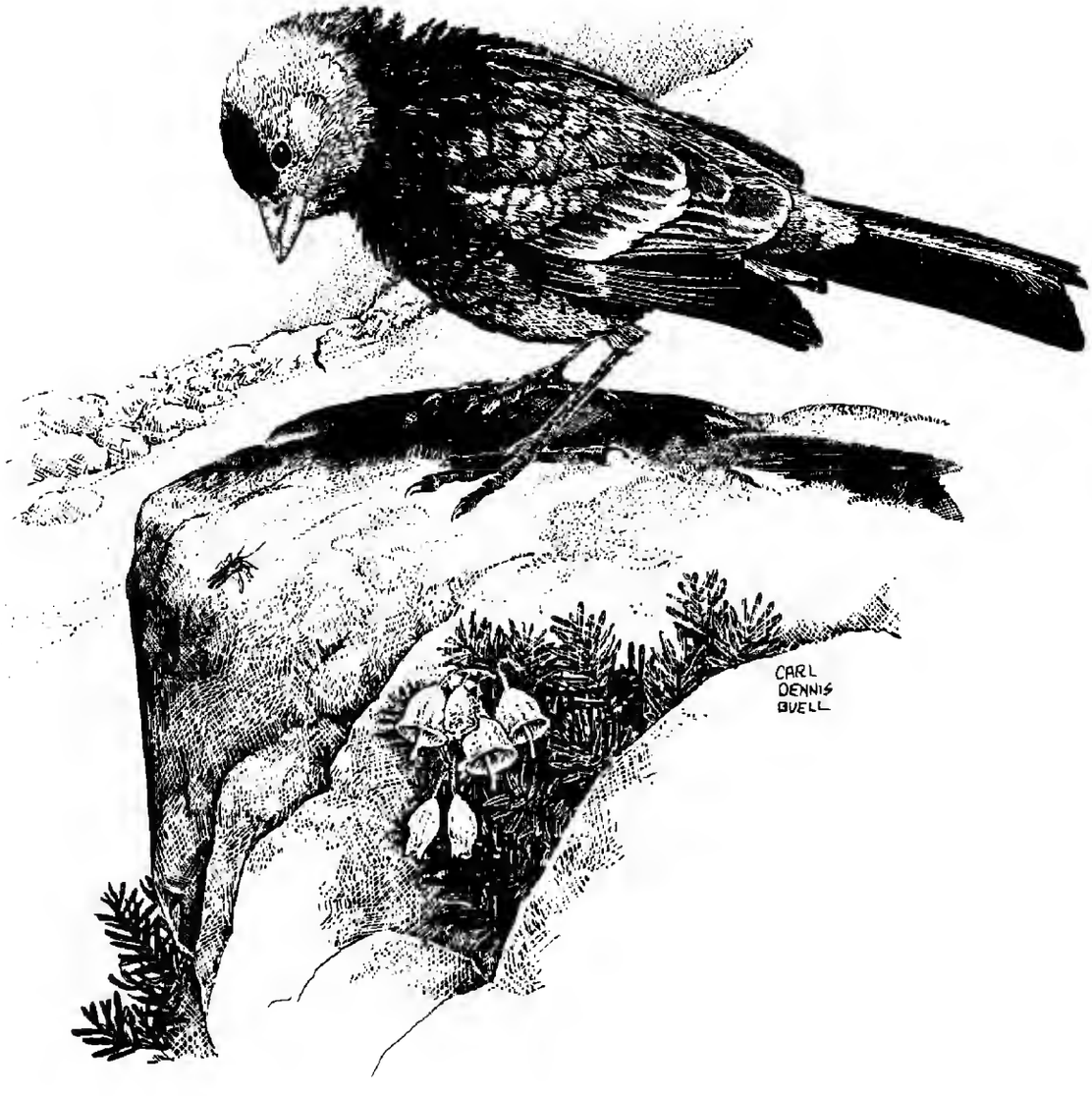


Gray-crowned Rosy Finch *Sketch by Carl Dennis Buell*

# BIRDS OF HOT SPRINGS MOUNTAIN, SAN DIEGO COUNTY, CALIFORNIA

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The mountains of San Diego County have never been the object of much ornithological study. The birds of other nearby ranges in southern California have been reported on by Grinnell (1908, San Bernardino Mts.), Grinnell and Swarth (1913, San Jacinto and Santa Rosa mts.), and Pequegnat (1945, Santa Ana Mts.). Information from the San Diego County mountains has been published only in a few brief notes or in comprehensive regional summaries (Cooper 1874, Emerson 1887, Belding 1890, McGregor 1899, Willett 1933, Grinnell and Miller 1944, Sams and Stott 1959). The highest peak in the county, isolated Hot Springs Mountain, has apparently not been previously visited by an ornithologist. Nothing relating to the birds of this area has been published, and no specimens collected there have been preserved in the San Diego Natural History Museum or in the Museum of Vertebrate Zoology, University of California, Berkeley. I made three visits to Hot Springs Mountain during June and July 1980. The observations here reported are an attempt to fill this gap in our knowledge of California bird distribution.

Mixed coniferous-oak woodland occurs in San Diego County at elevations above about 4000 feet (1200 m) in situations which receive an annual rainfall of over 18-20 inches (460-500 mm). The most extensive areas of this habitat correspond with five mountains or mountain ranges. Palomar Mountain, in the north-central part of the county, rises to 6140 feet (1871 m). Hot Springs Mountain, with its summit at 6533 feet (1991 m) is separated from Palomar by a broad treeless valley at an elevation of about 2800-3100 feet (850-950 m). This valley extends east to separate Hot Springs Mountain from Volcan Mountain, 5719 feet (1743 m), to the south. Farther south, in the central portion of the county, the Cuyamaca Mountains rise to 6512 feet (1985 m) on Cuyamaca Peak, and the Laguna Mountains, to 6272 feet (1912 m) on Monument Peak.

Woodland habitat on Hot Springs Mountain covers approximately 4 square miles (10 km$^2$), mostly on the northeastern and southeastern slopes. The dominant trees in this area are Jeffrey Pine (*Pinus jeffreyi*), Coulter Pine (*P. coulteri*), Ponderosa Pine (*P. ponderosa*), White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*), Black Oak (*Quercus kelloggii*), and Canyon Live Oak (*Q. chrysolepis*). The rest of the mountain is vegetated with dense mixed chaparral, or, particularly on the south slope, patches of chaparral scattered among grasses and other herbaceous plants. The latter situation is apparently the result of fire, clearing of brush, and cattle grazing. Three small streams were flowing on the mountain at the time of my visits. The largest of these, an apparently unnamed tributary of Agua Caliente Creek, descended the northeast slope, and along it the greatest numbers of birds were concentrated. Hot Springs Mountain is accessible by automobile from the village of San Ysidro on San Ysidro Creek at the south base of the mountain.

Bart Cord and I made the first visit to Hot Springs Mountain on 3 June, arriving about 1130, and departing about noon the following day. David Povey and I made the second visit, arriving 1945 on 23 June and departing 1400 on 24 June. The third visit was also made with David Povey; we

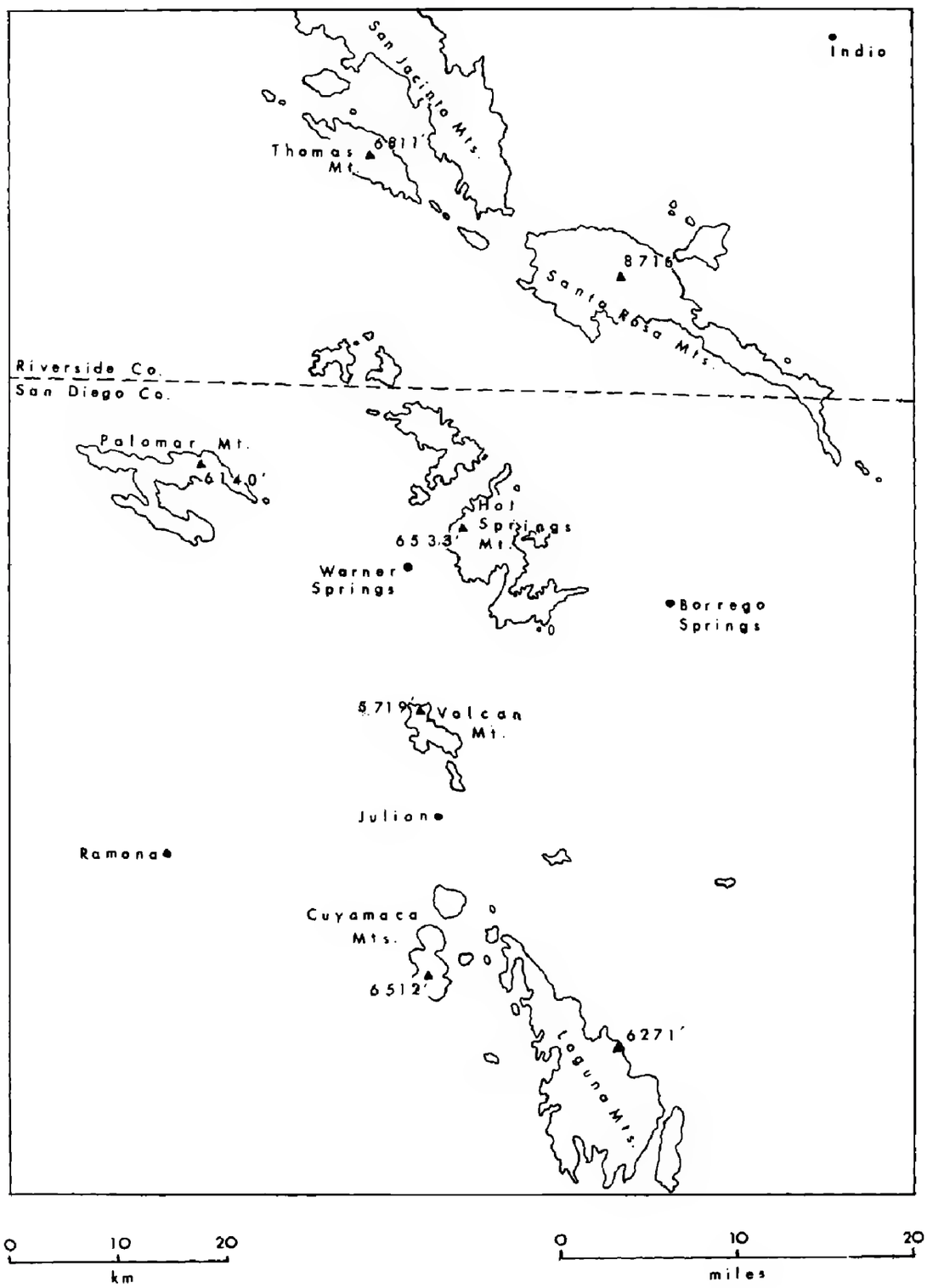


Figure 1. Hot Springs Mountain among nearby ranges in southern California. Contour illustrated is 5000 ft. elevation.

arrived 1930 on 21 July and left 1300 on 22 July. We concentrated our observations in dense woodland along and near the creek on the northeast slope, but also looked in several other areas on the mountain, and spent some time on each visit in more open woodland and dense chaparral near the summit. All species seen or heard were counted as accurately as possible.

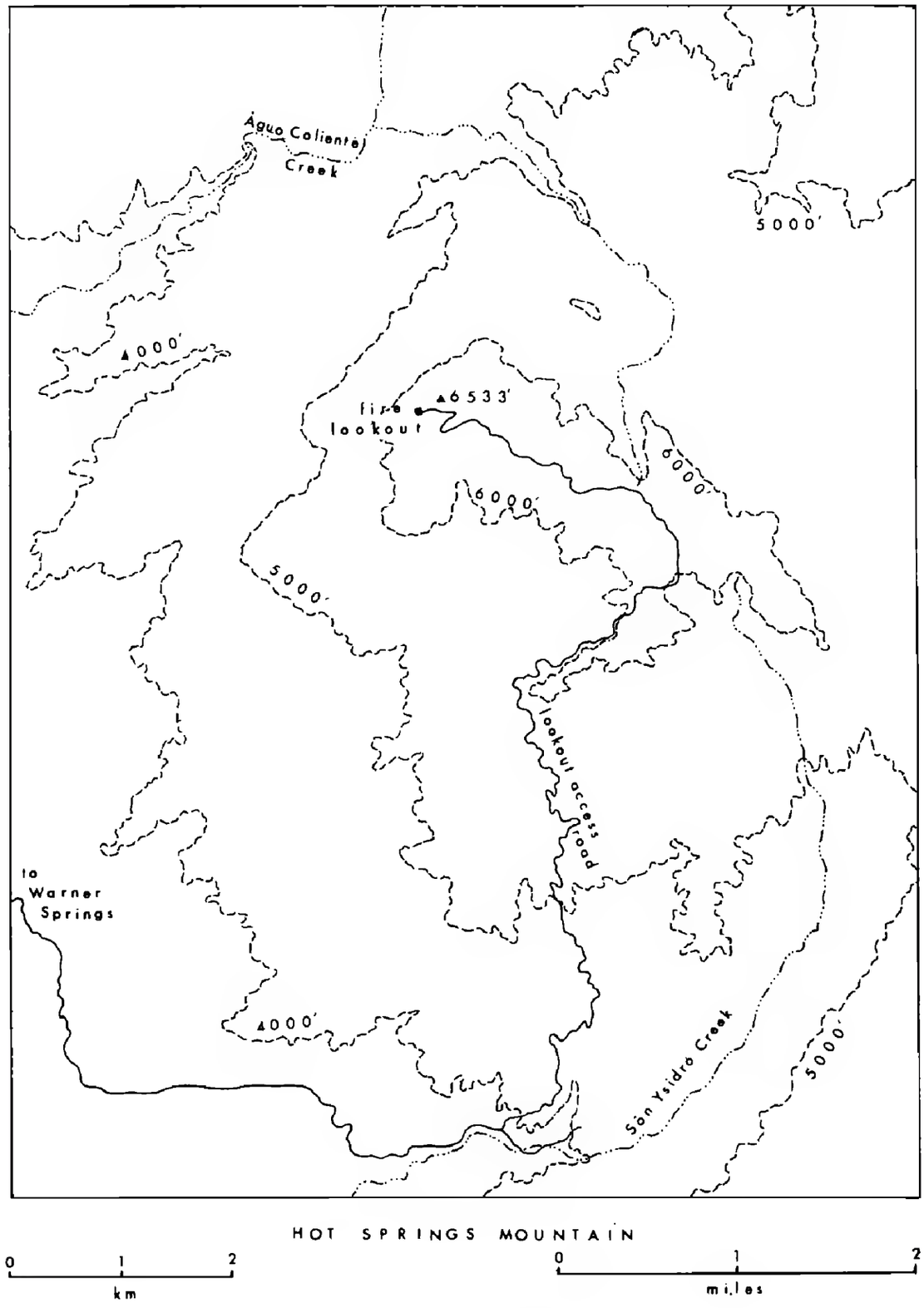


Figure 2. Detail of Hot Springs Mountain area, San Diego Co., California.

The timing of our visits was intended to cover the breeding season for most resident birds, and to avoid the problem of distinguishing local breeders from early or late migrants. I believe all species observed were potential, if not actual breeders on Hot Springs Mountain, except (*Selasphorus*) sp. (fall migrants reach San Diego County by late June) and Scott's Oriole (probably a post-breeding wanderer from nearby habitat downslope to the east). Definite reproductive activity (usually fledged young accompanying adults) was seen in Anna's Hummingbird, Calliope Hummingbird, White-headed Woodpecker, Scrub Jay, White-breasted Nuthatch, House Wren, Western Bluebird, Western Tanager, Black-headed Grosbeak, Rufous-sided Towhee and Dark-eyed Junco.

Our results are summarized in Appendix 1. Most of the species observed are widespread in the other mountains of San Diego County and do not require further comment. The occurrence of a few, however, merits discussion.

Calliope Hummingbird, *Stellula calliope*. On 4 June one male was seen in a meadow with scattered bushes along the creek on the northeast slope, elevation 5400 feet (1650 m). It chased off another hummingbird of equal size, presumably also a Calliope. On 24 June what was very likely the same male was seen in the same bush. It was displaying to a female: three or four steep dives in front of the female followed by a very slow descent. The birds also hovered in front of each other, very close together, but we did not see actual copulation. On 22 July a single female was seen near the same area. This is the first summer report of Calliope Hummingbird from San Diego County; potentially breeding birds had previously been noted south to the San Jacinto Mountains, where Dawson (1916) saw displaying males near Idyllwild and in Tahquitz Valley.

Dusky Flycatcher, *Empidonax oberholseri*. One was heard on 3 and 4 June about 1.3 miles (2.1 km) southeast of the summit at 6200 feet (1900 m) elevation. Dusky Flycatcher has only recently been found as a rare summer visitor south to San Diego County. I have also seen the species near the summit of Cuyamaca Peak (one on 1 July 1979) and along Agua Dulce Creek in the Laguna Mountains (pair with young in nest on 14 July 1974; 2 on 24 July 1976). David Povey saw a pair feeding a fledgling Brown-headed Cowbird near Cibbets Flat, Laguna Mountains, on 4 July 1978. Breeding Dusky Flycatchers were recorded previously south to the San Jacinto and Santa Rosa mountains, where Grinnell and Swarth (1913) found them "in abundance."

Red-breasted Nuthatch, *Sitta canadensis*. One was heard calling on 24 June in a very dense stand of trees on a steep north-facing slope 1.3 miles (2.1 km) east of the summit at 5900 feet (1800 m) elevation. Until recently, the breeding range of this nuthatch extended south in California to the San Jacinto Mountains, where Grinnell and Swarth (1913) found it in Tahquitz and Round valleys. The species has been noted a few times on Palomar Mountain, including a pair nesting in summer 1970 (McCaskie 1970) and a single bird on 19 May 1975 (Jon Dunn, field notes). In southwestern San Diego County, Red-breasted Nuthatches colonized planted conifers on Point Loma, where young were seen being fed in summer 1964 (McCaskie 1966); the species has remained there ever since.

Hermit Thrush, *Catharus guttatus*. One was heard singing on 24 June in the same place where the Red-breasted Nuthatch was noted. Although we were never able to see the bird, we approached it closely and heard the characteristic song very well:

well-spaced phrases, each phrase composed of a clear whistle followed by a series of rising and falling rapid notes. Hermit Thrushes have been recorded in the nesting season south only to the San Bernardino Mountains, so the present observation was completely unexpected.

Black-throated Gray Warbler, *Dendroica nigrescens*. The numbers seen of this species were surprising since it is very rare during the breeding season in San Diego County. I had previously seen it in the breeding season only three times, on Palomar Mountain on 26 June 1976, and in the Laguna Mountains on 13 July 1974 and 22 May 1975. Very little information is available on the breeding status of Black-throated Gray Warbler in San Diego County. Grinnell and Miller (1944) report it from Vallecito and the Cuyamaca Mountains, but it is undoubtedly only a migrant at the former locality. The San Diego Natural History Museum has two June specimens from Palomar Mountain (SDNHM 1414 and 19188), and the Western Foundation of Vertebrate Zoology has one egg set from Julian and another from the Laguna Mountains (WFVZ 72757 and 82925).

Green-tailed Towhee, *Pipilo chlorurus*. On 4 June one was seen about 1.5 miles (2.4 km) northeast of the summit. On 24 June two were seen together 1.3 miles (2.1 km) east of the summit. On both occasions the birds were in open woodland with scattered bushes and low herbaceous growth. Until recently, Green-tailed Towhee was known in summer south only to the San Jacinto Mountains. In 1978 small numbers were discovered near the summit of Cuyamaca Peak (D. Povey), and a juvenile was seen accompanying adults there on 29 July (pers. obs.).

## DISCUSSION

The summer distribution of montane birds among several mountain ranges in southern California and northern Baja California is presented in Table 1. This table is an expansion of Miller's (1951) Table 7, but I have included only those species whose breeding ranges are confined to elevations above 4000 feet in the mountain ranges listed. Footnotes refer principally to localities reported for a species since Grinnell and Miller (1944).

The mountains of San Diego County form a rather low area along the mountain system of the Transverse and Peninsular ranges. To the north, Mount San Jacinto reaches an elevation of 10831 feet (3301 m); to the south, the highest summit in the Sierra San Pedro Martir reaches 10135 feet (3089 m). The low elevation and small extent of coniferous forest habitat in San Diego County have made the area a barrier to the dispersal of boreal forest birds. Information in Grinnell and Miller (1944) and Miller (1951) indicates that 12 species reach the edges of their breeding ranges in the San Jacinto or Santa Rosa mountains (the report of Sharp-shinned Hawk nesting in San Diego County is undocumented and probably erroneous). An additional 7 species, absent as breeders in San Diego County, reappear to the south in the Sierra Juarez or Sierra San Pedro Martir. In recent years, 12 of these 19 have been noted during the nesting season in San Diego County mountains. Four (Red-breasted Sapsucker, Dusky Flycatcher, Red-breasted Nuthatch and Green-tailed Towhee) have definitely nested, and two others (Calliope Hummingbird and Fox Sparrow) have probably done so. All these situations however involve very small, localized or ephemeral populations, and do not significantly alter the basic pattern of bird geography.

Table 1. Breeding distribution of montane birds in southern California and northern Baja California. Species included are those whose breeding ranges are confined to elevations above 4000 feet (1200 m) in the mountain regions listed.

SB = San Bernardino Mts.
SJ = San Jacinto Mts.
SR = Santa Rosa Mts.
HS = Hot Springs Mt.
P = Palomar Mt.
V = Volcan Mt.
C = Cuyamaca Mts.
L = Laguna Mts.
J = Sierra Juarez
SPM = Sierra San Pedro Martir

| | SB | SJ | SR | HS | P | V | C | L | J | SPM |
|---|---|---|---|---|---|---|---|---|---|---|
| Northern Goshawk *Accipiter gentilis* | o [1] | + [2] | | | | | | | | |
| Sharp-shinned Hawk *Accipiter striatus* | × | + | | | | o [3] | ? [4] | | | |
| Flammulated Owl *Otus flammeolus* | × | o [5] | | | o [5] | | o [5] | | | |
| Saw-whet Owl *Aegolius acadicus* | × | o | | | + [6] | | × | | | |
| Common Nighthawk *Chordeiles minor* | × | o [7] | | | | | | | | |
| Black Swift *Cypseloides niger* | + | + | | | | | | | | |
| Calliope Hummingbird *Stellula calliope* | × | + | + [8] | + | | | | | | + |
| Red-breasted Sapsucker *Sphyrapicus ruber* | × | × | | | × [9] | | o [10] | | | |
| Williamson's Sapsucker *Sphyrapicus thyroideus* | × | × | | | | | | | | |
| Hairy Woodpecker *Picoides villosus* | × | × | + | + | + [11] | + | + | + [12] | + | + |
| White-headed Woodpecker *Picoides albolarvatus* | × | × | × | × | + [13] | + | × | + [14] | | |
| Dusky Flycatcher *Empidonax oberholseri* | × | × | × | o | | | o [15] | × [15] | | |
| Olive-sided Flycatcher *Contopus borealis* | × | × | + | + | × [16] | + | × | × [17] | + | + |
| Steller's Jay *Cyanocitta stelleri* | × | + | + | + | × | × | × | × [18] | | |
| Piñon Jay *Gymnorhinus cyanocephalus* | × | × | | | | | | | + | + |
| Clark's Nutcracker *Nucifraga columbiana* | × | + | + | | o [19] | | | o [20] | | + |
| Mountain Chickadee *Parus gambeli* | × | × | × | + | × | + | + | × | + | + |
| Red-breasted Nuthatch *Sitta canadensis* | + | + | | o | × [15] | | | | | |
| Pygmy Nuthatch *Sitta pygmaea* | × | × | × | + | + [21] | + | + | × | + | + |
| Brown Creeper *Certhia familiaris* | × | × | + | + | + | | × | + | | |
| Hermit Thrush *Catharus guttatus* | × | | | o | | | | | | |

Table 1 *(Cont.)*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mountain Bluebird *Sialia currucoides* | × | | | | | | | | | |
| Townsend's Solitaire *Myadestes townsendi* | × | × | o [22] | | o [23] | | | | | |
| Golden-crowned Kinglet *Regulus satrapa* | × | × | | | | | | | | |
| Ruby-crowned Kinglet *Regulus calendula* | × | × | | | | ? [24] | | o [25] | | |
| Yellow-rumped Warbler *Dendroica coronata* | × | × | × | | o [26] | | o [27] | | | × |
| Western Tanager *Piranga ludoviciana* | × | × | + | × | × | × [28] | × | + [29] | + | + |
| Purple Finch *Carpodacus purpureus* | × | + | | + | + | o | + | + | × | |
| Cassin's Finch *Carpodacus cassinii* | × | × | + [30] | | | | | | | + |
| Pine Siskin *Carduelis pinus* | × | × | o | | o [31] | | | | + | + |
| Red Crossbill *Loxia curvirostra* | + | + | | | | | | | × | × |
| Green-tailed Towhee *Pipilo chlorurus* | × | × | × [32] | o | | | × [15] | | | |
| Dark-eyed Junco *Junco hyemalis* | × | × | + | × | × | × | × | + | + | + |
| Fox Sparrow *Zonotrichia iliaca* | × | × | + [33] | | o [34] | | + [35] | | | |
| Lincoln's Sparrow *Zonotrichia lincolnii* | × | × | | | | | | | | |

× = nesting activity definitely observed at least once
+ = birds observed repeatedly during summer, so probably breeding, but nesting activity not definitely reported
o = observed at least once during nesting season, but no strong evidence of local breeding
? = questionable record

AFN indicates *Audubon Field Notes*, AB indicates *American Birds*.

1. One seen "above Big Bear Park (7500 ft. altitude)" on 22 July 1947 (AFN 1:190, 1947); 2 seen at Green Valley on 21 May 1978 (AB 32:1208, 1978).

2. Several recent observations; see AB 32:1208, 1978.

3. Two seen in Banner Canyon on 29 April 1978 (AB 32:1208, 1978).

4. J.B. Dixon's identifications of this species "in the Cuyamacas and other mountains of San Diego County" (Willett 1933:41) are probably erroneous.

5. Winter 1974.

6. Two seen on 19 May 1975 (AB 29:1032, 1975); a few other sight records.

Table 1 *(Cont.)*

7. One collected on 23 June 1893, altitude 8000 ft. (SDNHM 431).

8. One seen on 22 July 1979 (J. Dunn); 2 on 21 June 1980 (G. McCaskie).

9. Devillers 1970.

10. One seen near Paso Picacho Campground on 10 May 1974 (pers. obs.).

11. Many observations by E. Beemer (pers. comm.); specimens collected on 8 and 10 July 1935 (SDNHM 19094-5).

12. Many pers. obs.; specimens collected on 8 June 1924 (SDNHM 31707) and 15 January 1946 (MVZ 94435).

13. Many observations by E. Beemer (pers. comm.).

14. One seen in April 1970 (pers. obs.); 1 on 6 November 1975 (M. Thornburgh pers. comm.); 1 on 27 January 1978 (C.G. Edwards pers. comm.).

15. See text.

16. Many observations, including fledglings, by E. Beemer (pers. comm.); specimen collected on 30 June 1899 (SDNHM 617).

17. Many pers. obs.; eggs collected on 4 July 1923 (WFVZ 71133).

18. Many pers. obs.; 3 egg sets in WFVZ.

19. One seen on 24 June 1967 (AFN 21:605, 1967).

20. Fortiner 1920; 1 on 25 May 1974 (pers. obs.).

21. Two seen on 16 July 1978 (pers. obs.); other sight records.

22. One seen on 16 June 1974; 2 on 22 July 1979 (J. Dunn).

23. One seen on 19 July 1980 (AB 34:931, 1980).

24. W.O. Emerson's (Belding 1890:246) speculation that this species "perhaps breeds in the firs" has never been supported by facts.

25. One seen on 30 May 1974 (AB 28:950, 1974).

26. Four sightings of single individuals (E. Beemer pers. comm.).

27. One seen on 29 July 1978 (pers. obs.).

28. Egg set collected at Julian on 17 June 1915 (WFVZ 64938).

29. Many pers. obs., e.g., a pair on 25 June 1978.

30. Thirty seen on 16 June 1974 (J. Dunn); 2 on 14 July 1979 (G. McCaskie).

31. One seen on 19 July 1966 (AFN 20:600, 1966).

32. One adult and 1 juvenile seen on 22 July 1979 (J. Dunn).

33. Six seen on 22 July 1979 (G. McCaskie).

34. Three or 4 pairs seen in summer 1979 (AB 33:898, 1979).

35. Numerous reports since 1978, e.g., 10 on 1 July 1979 (pers. obs.).

The mountains of San Diego County, though not supporting a continuous area of coniferous woodland habitat, nevertheless compose a cohesive region of bird distribution, as originally indicated by Miller (1951). No major breaks in the distribution of any species occur between any of the five mountain areas. Any difference in the avifauna of the various ranges involves the marginal species mentioned above, or is probably an artifact of inadequate exploration. As well as lacking several species present in the San Jacinto and Santa Rosa mountains, the avifauna of the San Diego County mountains shows some differences from that of the Sierra Juarez and Sierra San Pedro Martir in Baja California. Saw-whet Owl, White-headed Woodpecker, Steller's Jay and Brown Creeper have not spread south of the international border, while Calliope Hummingbird, Pinon Jay, Clark's Nutcracker, Yellow-rumped Warbler, Cassin's Finch, Pine Siskin and Red Crossbill, which inhabit Baja California, are not regular breeders in the mountains of San Diego County. Grinnell (1928) describes other cases of differentiation at the subspecific level.

## ACKNOWLEDGMENTS

I thank Banning Taylor of the Los Coyotes Indian Reservation, in which Hot Springs Mountain is situated, for granting permission to visit the area. Evelyn Norte and Carrie Etheridge kindly provided access to the road up the mountain. Guy McCaskie and Jon Dunn generously supplied information from their personal field notes. Elizabeth Copper read and commented on the manuscript and greatly helped with the figures. I especially thank Bart Cord and David Povey for their interest in this project and invaluable support in the field.

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Appendix 1. Species and numbers of birds observed on Hot Springs Mountain, San Diego Co., California. The three numbers indicate respectively the numbers of each species recorded on each of the three trips. Time spent in observation was 14 hours on 3-4 June, 9 hours on 23-24 June, and 8 hours on 21-22 July, 1980.

Red-tailed Hawk *Buteo jamaicensis* (4, 1, 1), Mountain Quail *Oreortyx pictus* (16, 4, 4), Band-tailed Pigeon *Columba fasciata* (20, 9, 13), Mourning Dove *Zenaida macroura* (8, 3, 2), Anna's Hummingbird *Archilochus anna* (14, 8, 3), Calliope Hummingbird (2, 2, 1), Rufous/Allen's Hummingbird *Selasphorus* sp. (0, 0, 5), Common Flicker *Colaptes auratus* (6, 4, 4), Acorn Woodpecker *Melanerpes formicivorus* (42, 28, 30), Hairy Woodpecker *Picoides villosus* (4, 4, 2), Nuttall's Woodpecker *Picoides nuttallii* (2, 0, 2), White-headed Woodpecker *Picoides albolarvatus* (2, 13, 8), Ash-throated Flycatcher *Myiarchus cinerascens* (13, 9, 9), Dusky Flycatcher (1, 0, 0), Western Flycatcher *Empidonax difficilis* (3, 3, 0), Western Wood Pewee *Contopus sordidulus* (18, 11, 10), Olive-sided Flycatcher *Contopus borealis* (2, 2, 3), Violet-green Swallow *Tachycineta thalassina* (30, 25, 25), Steller's Jay *Cyanocitta stelleri* (37, 22, 19), Scrub Jay *Aphelocoma coerulescens* (13, 1, 5), Common Raven *Corvus corax* (2, 1, 0), Mountain Chickadee *Parus gambeli* (80, 66, 62), Plain Titmouse *Parus inornatus* (13, 5, 14), Bushtit *Psaltriparus minimus* (4, 8, 6), White-breasted Nuthatch *Sitta carolinensis* (10, 9, 10), Red-breasted Nuthatch (0, 1, 0), Pygmy Nuthatch *Sitta pygmaea* (3, 2, 0), Brown Creeper *Certhia familiaris* (8, 4, 2), Wrentit *Chamaea fasciata* (7, 5, 8), House Wren *Troglodytes aedon* (39, 22, 20), Bewick's Wren *Thryomanes bewickii* (1, 0, 5), California Thrasher *Toxostoma redivivum* (2, 2, 0), American Robin *Turdus migratorius* (0, 0, 2), Hermit Thrush (0, 1, 0), Western Bluebird *Sialia mexicana* (43, 15, 21), Orange-crowned Warbler *Vermivora celata* (0, 2, 4), Black-throated Gray Warbler (0, 1, 3), Scott's Oriole *Icterus parisorum* (0, 0, 1), Northern Oriole *Icterus galbula* (0, 0, 1), Brown-headed Cowbird *Molothrus ater* (3,

Appendix 1 *(Cont.)*

3, 3), Western Tanager *Piranga ludoviciana* (18, 9, 10), Black-headed Grosbeak *Pheucticus melanocephalus* (6, 0, 17), Purple Finch *Carpodacus purpureus* (13, 4, 4), House Finch *Carpodacus mexicanus* (0, 6, 5), Lesser Goldfinch *Carduelis psaltria* (4, 14, 10), Lawrence's Goldfinch *Carduelis lawrencei* (0, 2, 3), Green-tailed Towhee (1, 2, 0), Rufous-sided Towhee *Pipilo erythrophthalmus* (3, 22, 18), Lark Sparrow *Chondestes grammacus* (1, 2, 4), Dark-eyed Junco *Junco hyemalis* (67, 23, 14), Chipping Sparrow *Spizella passerina* (1, 1, 0), Black-chinned Sparrow *Spizella atrogularis* (5, 0, 0).

*Accepted 4 September 1981*

Black-throated Gray Warbler *Sketch by Tim Manolis*

# TREASURER'S REPORT

WESTERN FIELD ORNITHOLOGISTS, INC.

Cash Flow Statement for 1 January 1980 to 31 December 1980

| | | |
|---|---|---|
| Cash on hand, 1 January 1980 | | $17,041.46 |
| Gibraltar Savings & Loan (savings) | $ 9,104.04 | |
| Crocker National Bank (checking) | 7,937.42 | |
| RECEIPTS | | |
| Membership | $ 5,284.97 | |
| Boat Trips | 2,352.80 | |
| Annual Meeting - 1980 | 1,388.00 | |
| Back Issues | 447.75 | |
| Reprints | 441.67 | |
| Interest | 491.19 | |
| Advertising | 11.09 | |
| Sales Tax Received | 26.50 | 10,443.97 |
| | | $27,485.43 |
| DISBURSEMENTS | | |
| Western Birds | $12,877.55 | |
| Boat Trips | 2,035.50 | |
| Annual Meeting - 1980 | 1,558.75 | |
| Membership/Business Services (1) | 1,466.35 | |
| Postage | 610.85 | |
| Miscellaneous | 149.70 | |
| Sales Tax Paid | 29.12 | 18,727.82 |
| Cash on hand, 31 December 1980 | | $ 8,757.61 |
| Gibraltar Savings & Loan (savings) | $5,291.48 | |
| Bank of America (checking) | 3,466.13 | |

(prepared without audit)

J. Garth Alton, *Treasurer*

(1) Includes Business Services Honorarium of $100.00 monthly

# NOTES

## FORAGING BEHAVIOR OF A CROSS-BILLED NUTCRACKER

DIANA F. TOMBACK, Department of Biology, Division of Natural and Physical Sciences, University of Colorado at Denver, 1100 Fourteenth Street, Denver, Colorado 80202
BARBARA B. DEWOLFE, Department of Biological Sciences, University of California, Santa Barbara, California 93106

Bill morphology is adapted to feeding niche in many avian species (e.g. Myton and Ficken 1967, Newton 1967). Consequently bill deformities, depending on their severity, may reduce an individual's longevity and reproductive success. For species with broad foraging niches, i.e. generalists, individuals with abnormal feeding structures may compensate somewhat by restricting their efforts to whatever alternative foraging patterns or prey sizes are available.

The behavior and morphology of the Clark's Nutcracker (*Nucifraga columbiana*) are adapted to a specialized diet of fresh and stored pine seeds (Bock et al. 1973, Vander Wall and Balda 1977, Tomback 1977, Tomback 1980). Yet, like other corvids, nutcrackers opportunistically forage on berries, bird eggs, picnic and trash scraps, insects and spiders, and scavenge and prey upon rodents, nestlings, and other small vertebrates (Tomback 1977 and references therein, Giuntoli and Mewaldt 1978, Mulder et al. 1978).

On 23 August 1980 we saw a nutcracker foraging on Deer Mountain Trail, ca. 100 m from Deer Ridge Junction, elevation ca. 2590 m, Rocky Mountain National Park, Colorado. The upper and lower mandibles of the nutcracker were overgrown by about 1 cm. Possibly, the extra length forced the normally slightly decurved upper mandible to cross down and to the left of the lower mandible. The lower mandible was twisted out of alignment distally so that the dorsal and ventral surfaces near the tip were nearly lateral. When the bird vocalized (Regular Call, Mewaldt 1956), it opened its mandibles in normal fashion.

From 1015 to 1038 and from 1045 to 1053 the nutcracker foraged on the ground for large, black ants (*Formicidae*) and other insects. Two foraging patterns were used: the nutcracker either probed the gravel substrate with its closed bill or gleaned from the substrate surface. Most of these foraging efforts were concentrated on or around an ant nest and appeared successful. Before and between foraging bouts, the nutcracker perched on a fallen log or in a Ponderosa Pine (*Pinus ponderosa*). Observations terminated when the nutcracker flew off at the approach of horses and riders.

Except that it lacked the left five, white rectrices, the nutcracker seemed in fair condition. The bird was molting body plumage, which was typical at that time for the species (Mewaldt 1958). As suggested by the patches of buffy feathers on the lateral, upper dorsal region, the nutcracker had reached an advanced stage of postjuvenal molt somewhat earlier than usual.

Several factors suggested that the foraging behavior of the nutcracker represented an accommodation to an aberrant bill morphology: At this time of year 1) nutcrackers eat primarily ripening pine seeds, and 2) most nutcrackers are at subalpine elevations (Tomback 1977). No other nutcrackers responded to this individual's locational calls (Tomback, unpubl. data), nor did we observe other nutcrackers during the 2 hrs we spent in the vicinity. It is unusual for nutcrackers to be solitary at any time of year, and especially so for a recently-independent juvenile.

It was doubtful that the nutcracker was capable of harvesting and manipulating pine seeds, which requires complex motor skills (Tomback 1977). However, despite its handicap, the nutcracker had apparently sustained itself by foraging opportunistically. In contrast, on 29 August 1973, Tomback (unpubl. data) observed a juvenile whose lower mandible was broken off at the base. At least a week after other juveniles were foraging independently, this bird continually begged for food and pursued a parent. The parent was not observed to feed the persistent youngster and repeatedly attempted to evade it.

ACKNOWLEDGMENTS

We thank L. Richard Mewaldt for his comments on the manuscript.

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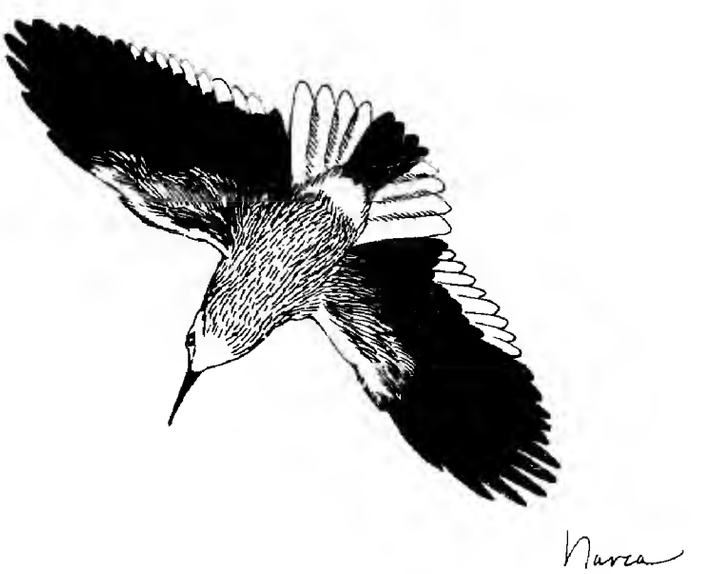

Clark's Nutcracker

*Sketch by Narca Moore*

# DEFENSIVE BEHAVIOR OF AN IMMATURE CALIFORNIA CONDOR

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On 24 June 1980 I observed an immature-plumaged California Condor (*Gymnogyps californianus*) engaged in a mode of defensive behavior not previously recorded. The observations occurred in San Luis Obispo County, immediately north of the Santa Barbara County line, within 250 m south of State Highway 166. All observations were with an 8x 35 binocular or a 60x scope.

I observed the bird from 1845 until 1927 when the bird soared out of view over a low ridge. It was first noted at about 250 m distance in alternating soaring and flapping flight. It was attempting, ineffectually, to clear a low ridge while being propelled toward the ridgecrest by a brisk west wind. Unable to clear, the condor landed and after a brief pause walked eastward uphill some 15 m to cross the gently contoured ridgecrest. It then ran about 6 m downwind down the reverse slope and again became airborne. Despite several bouts of flapping, it lost altitude relative to the descent of the slope and it came to earth again after approximately a 30 m flight. The condor repeated this several times while I paralleled its forward progress from my vehicle about 75 m distant. At 1905 it took flight and gained altitude by interchanging bouts of downwind flapping with tight spiral soaring turns into the wind. Its flight path brought it within 10 m of my vehicle and as it passed directly overhead, I stopped to photograph it. The bird promptly banked and with alternating flap-and-soar flight flew south about 250 m and alighted on a northfacing slope.

At this point, as I observed through the scope, a pair of Northern Ravens (*Corvus corax*) appeared and began to dive alternately at the condor. The condor then exhibited the following behavior: As each raven in flight drew within about 3 m of the condor standing on the ground, the condor would align the long axis of its body directly with the approaching raven and with mandibles parallel to the ground, attain a fully upright stance with the legs extended. It would then partially extend the wings away from the body while simultaneously raising the scapulars and wing coverts into an erect or "fluffed-out" configuration. The condor would very slightly dip its head down as the raven passed directly overhead, then take a brisk step or two forward and turn promptly to be in position to again face directly a new assault. I was too distant to determine if any vocalism accompanied this behavior, but the mandibles remained closed. After a series of swoops, one or both ravens would pause for 15 to 45 seconds before resuming their sorties toward the condor. During this interim, the condor would slowly retract its neck so that the back of the head descended to contact the ruff, the tarsi would flex to a half-folded position, and the wings would be slowly returned to a normal position against the body with the scapulars relaxing over the folded wings. The general pattern was repeated in six series of confrontations with the ravens over a 19 min period.

Koford (The California Condor, Dover, New York, 1957:118) describes a threat attitude exhibited by nestlings 8 to 12 weeks old as elicited by intruders at a nest site, but there are differences in posture and vocal response between his observations and

those I observed in the fully fledged immature. The nestling noted by Koford "holds its head low in front of the body, opens its bill and protrudes its tongue, erects the interscapulars and raises the ruff . . . and gives the hiss-grunt." At 12 weeks, "the tail is held stiffly and is raised above the line of the back at an angle of about 30 degrees." The immature I observed held a markedly different posture and did not appear to vocalize.

I thank Sandy Wilbur for valuable critical review of an earlier draft of the manuscript.

*Accepted 15 February 1982*

California Condor *Sketch by Tim Manolis*

# DIPPERS CAPTURING FISH DURING WINTER IN THE YUKON TERRITORY

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While involved in avian and fisheries investigations in the Yukon Territory for Foothills Pipe Lines (Yukon) Ltd. and Foothills Pipe Lines (South Yukon) Ltd., we had opportunities to observe and discuss Dipper (*Cinclus mexicanus*) feeding behaviour. On 30 March 1978 Young encountered two Environment Canada employees who were studying flow characteristics of Engineer Creek, 65°21'N, 138°19'W. The employees indicated that in mid-December 1977 they observed a Dipper emerge from the creek with a "small" (less than 7 cm) fish in its bill. When they approached the bird, it flew off, dropping the fish, which was identified as an Arctic Grayling (*Thymallus arcticus*).

On 7 March 1980, while electrofishing in Mirror Creek (62°28'N, 140°54'W), Kratt observed a Dipper emerge from the water with a small (approximately 5 cm) fish in its bill. Shortly after perching on a log, the bird dropped the wriggling fish into the creek but quickly dove into the water to retrieve it. Again emerging from the water, the Dipper flew to shore and swallowed the fish, head first. Fishery sampling revealed the presence of Arctic Grayling, Lake Chub (*Couesius plumbeus*) and Slimy Sculpin (*Cottus cognatus*). Although a positive identification could not be made, we assume that the fish consumed by the Dipper was either a small Arctic Grayling or a Lake Chub as the fish definitely did not resemble a Slimy Sculpin.

Dippers are generally considered to feed opportunistically, primarily on invertebrates (Mitchell 1968, Thut 1970, Sullivan 1973, Price 1975, Ealey 1977). Nonetheless, several authors have observed them eating fish in more southern latitudes (Michael 1922, Cordier 1927, Bent 1948, Sullivan 1973, Jost 1975, Ealey 1977, D.M. Ealey, pers. comm.)

Our observations of Dippers eating fish are of interest as they represent probably the first published evidence of this behaviour under winter conditions in northern Canada. We suspect that Dippers are likely more successful at capturing fish when the fish are relatively slow-moving (i.e., at low water temperatures) (Beamish 1978), or relatively immobile (e.g. at the time of hatching or emergence). We suggest that fish could be important in allowing Dippers to survive winter in northern latitudes. The significance of this food source is worth further investigation.

We thank Foothills Pipe Lines (Yukon) Ltd. for permission to publish this manuscript. We also thank Martin K. McNicholl and Tim Manolis for their review of the manuscript.

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*Accepted 26 December 1981*

# BULLETIN BOARD

## INTERNATIONAL SYMPOSIUM ON THE TAMAULIPAN BIOTIC PROVINCE

The Symposium will include all ecological aspects of the biome: vegetation, invertebrates, vertebrates, ecological structure and function, biological resources (use and effects), management. It will include aspects of applied science and conservation. The meeting will be held at La Quinta Royale Motor Inn, Corpus Christi, Texas, 28-30 October 1982. Those interested in contributing papers should submit an abstract by 1 August 1982; abstracts for invited papers must be received by 1 September 1982. For information on either, contact Gene W. Blacklock, Curator, Welder Wildlife Foundation, P.O. Drawer 1400, Sinton, Texas 78387 or David Riskind, Head, Resource Management Section, Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744. For information on registration contact Jimmie R. Picquet, Director, John E. Conner Museum, Texas A&I University, P.O. Box 2172, Kingsville, Texas 78363.

## REQUEST FOR OBSERVATIONS OF GOSHAWKS AND WILLOW FLYCATCHERS

The California Department of Fish and Game is undertaking studies of the Goshawk (*Accipiter gentilis*) and the Willow Flycatcher (*Empidonax traillii*) in California to document distribution, abundance, habitat requirements, and reproductive success. Please send any reports of recent sightings (within the past decade) of breeding Goshawks and Willow Flycatchers to Ronald W. Schlorff, California Department of Fish and Game, 1416 Ninth Street, Sacramento, CA 95814. Please include your name, address and phone number, along with the following: location of sighting (if possible, include township, range, section, ¼ section, and ideally, a copy of a topographic map), date of observation, behavioral notes, and any other relevant information such as threats to habitat or evidence of flycatcher nest parasitism by Brown-headed Cowbirds (*Molothrus ater*). Goshawk nest locations will be kept confidential and will be made available only to those persons involved in legitimate research and management of the species. This information will assist State and Federal agencies in developing habitat protection and species management plans for these species of special concern.

# IDENTIFICATION NOTES

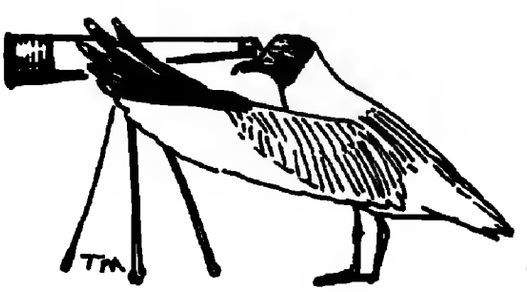
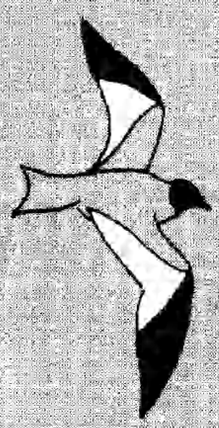
The bird pictured here, with its large head, big bill, huge talons and regal bearing, is most definitely a buteo. Noting the dark bib, one might first consider the adult light phase Swainson's Hawk (*Buteo swainsoni*). However,

Swainson's Hawk has a white patch over the bill, a distinct white throat and a somewhat darker bib. Looking at the bill, one can see that it is very wide, extending at the gape to the posterior edges of the eyes. The tarsi, which are more easily seen in the picture of the bird's back, are feathered all the way to the toes. This combination of feathered tarsi and large, wide bill are diagnostic of only one buteo.

The bird is a Ferruginous Hawk (*Buteo regalis*) in fresh first-year plumage. This plumage, totally neglected in the field guides, is described by Bent (Life histories of North American birds of prey, Part 1, U.S. Natl. Mus. Bull. 167, 1937:288); it is retained through the first winter, but the brown tends to wear or fade from the tarsal and chest feathers, leaving a bird with virtually all white underparts.

There are two other buteos which could be confused with the first-year Ferruginous Hawk. The adult Rough-legged Hawk (*Buteo lagopus*) exhibits a rather rare plumage variation (Cade, Condor 57:313-346, 1955) in which the belly is whitish and there may be a dark band across the chest. However, these birds retain the distinctive tail and wing pattern of the Rough-legged Hawk, i.e., the black wrist patch on the under-wing and black band at the end of the tail, and should be easily distinguishable in flight.

The first-year Ferruginous Hawk can bear a superficial resemblance to Krider's Red-tailed Hawk (*Buteo jamaicensis krideri*). The latter, however, lacks the Ferruginous' unbarred, white-based primaries, broad bill and feathered tarsi.

These pictures were taken in the summer of 1981 on Pawnee National Grasslands, Weld Co., Colorado, by Diane Larson.

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